DIRECT TRANSLATION OF GERMAN APPLICATION

by

KILIAN SAUERESSIG

for a

ARRANGEMENT AND METHOD FOR EMBOSSING WEB-SHAPED MATERIALS

PILLSBURY WINTHROP SHAW PITTMAN LLP
1650 Tysons Boulevard
McLean, VA 22102-4859
(703) 770-7900
Attorney Docket No.: B&B-134

Roller arrangement for embossing web-shaped materials

The invention discloses a roller arrangement for embossing web-shaped materials, in particular, web-shaped paper and tissue materials comprising a punch on which a first embossing pattern with a plurality of spaced-apart elevations is arranged, and a matrix on which a second embossing pattern with a plurality of spaced-apart elevations is arranged. The elevations on the first embossing pattern can be lowered into free spaces on the second embossing pattern.

When the first embossing pattern and the second embossing pattern are geometrically adjusted on top of each other in such a way that the elevations mutually substantially correspond at a number of locations a micro fissure embossing is possible. In other words, the geometry of the embossing pattern breaks the fibers of the web-shaped material thus greatly increasing the water absorbency capability of said fibers. During the embossing of the web-shaped paper and tissue materials, paper fibers as well as dust adhere to the gaps of the embossing pattern which seriously contaminates the punch and matrix. Up until now, production would be interrupted to allow for the cleaning of the roller to achieve good embossing results.

It is the object of the present invention to configure a roller arrangement for embossing web-shaped materials in such a way that cleaning can occur during operation.

This object is achieved with a roller arrangement in accordance with claim 1. In accordance with the invention, the elevations on the embossing pattern of the punch or matrix is arranged in rows that are spaced apart in the circumferential direction while at least one cleaning roller is provided which comprises cleaning elements arranged in the circumferential direction which run between the rows of elevations on the embossing pattern of the punch or the matrix. Conveniently, both the punch and the matrix are each fitted with a cleaning roller which is located outside the path of the web-shaped material to allow interaction with either the punch or the matrix. During operation the cleaning elements continuously run between the elevations on each embossing pattern collecting paper fibers and dust.

Advantageously, the cleaning elements run in the circumferential direction of the cleaning roller so it is itself cleaned.

The cleaning elements could also be radially offset in the axial direction of the cleaning roller to guarantee smooth and non-plucking operation of the cleaning roller.

Conveniently, the cleaning elements are knife-like cleaning studs the geometry of which conforms to the geometry of the embossing pattern.

Finally, the elevations on the embossing pattern could also be arranged in a checker board pattern whereby the shape of each elevation is of lesser importance. Seen from a top view, the elevations could, for example, be cross shaped, square, oval or a similar shape, as long as the desired micro fissure embossing is achieved as the punch and matrix interact.

Below, the invention is described in greater detail in the enclosed figures. They show:

Figure 1 A schematic representation of a punch in accordance with a first embodiment of the present invention;

Figure 2 a schematic representation of a cleaning roller that interacts with the punch in figure 1;

Figure 3 a schematic representation of a punch in accordance with a second embodiment of the present invention;

Figure 4 a schematic representation of a cleaning roller that interacts with the punch in figure 3;

Figure 5 an illustration of the path of the cleaning elements in figure 2 between the elevations on the punch in figure 1;

Figure 6 an illustration of the path of the cleaning elements in figure 4 between the elevations on the punch in figure 3;

Figure 7 a schematic representation of a punch in accordance with a third embodiment of the present invention;

Figure 8 a schematic representation of a cleaning roller that interacts with the punch in figure 7; and

Figure 9 a schematic representation of the interaction of the punch and cleaning roller in figures 7 and/or 8;

The punch 10, represented in figure 1, is fitted with an embossing pattern consisting of elevations 6 arranged in rows 12, 14 in circumferential direction which, when seen from above, are all identical and cross shaped whereby the elevations 16 also are arranged in a checker board pattern. The punch in figure 1 interacts with a cleaning roller 20 from figure 2 on which several cleaning studs 26, 26', 28 are arranged in rows 22, 24 in circumferential direction. The cleaning studs 26, 26' of each row are spaced apart in circumferential direction so the cleaning function is briefly interrupted during operation which prevents the cleaning studs 26, 26' from clogging as they pass very closely by the elevations. During the interruption, collected paper fibers can be removed from between the cleaning studs 26, 26' by the cleaning roller. The cleaning studs 26, 28 are radially spaced apart in the axial direction of the embossing roller 20 in such a way that they, as a group of cleaning studs, successively run between the spaced apart rows of elevations preventing plucking of the cleaning roller 20 in the punch. The angular arrangement of the cleaning studs 26, 28 is encountered in such a way that only one cleaning stud at any one time runs on an axial line of the cleaning roller 20.

Figure 3 shows a schematic representation of a variation of a punch 30 also fitted with elevations 36 arranged in rows 32, 34 in a checker board pattern, however, the distance between them is greater than in the embodiment shown in figure 1. Correspondingly, the cleaning roller 40

shown in figure 4 is fitted with wider cleaning studs 44, 46', 48 so that the paper fibers and dust between the rows 32, 34 is completely gathered.

Figure 5 shows the path A of cleaning roller 20 between the elevations on the embossing pattern of the punch 10 from figure 1. By geometrically complementing the shape of the elevations and the dimension of the cleaning studs it is ensured that all fibers and all dust are removed from the surface of the embossing roller facilitating a good embossing result. The interaction between the punch 30 shown in figure 3 and the path B of the cleaning roller 40 shown in figure 4 is depicted in figure 6.

Figure 7 shows a third embodiment of a punch with a pattern of regularly spaced-apart basically rectangular elevations 50 whose circumferential contour is slightly convex. A pattern for a possible matching cleaning roller is shown in figure 8. The cleaning studs 52 that run in circumferential direction are fitted with horizontally running stud segments 54 that correspond with the spaced-apart elevations 50 of the punch in figure 7, whereby axially neighboring stub segments 54 are separated by a free space 56. The interaction of the punch in accordance with figure 7 and the cleaning roller in accordance with figure 8 is shown in figure 9.

The characteristics of the invention revealed in the above description, in the drawings, as well as in the patent claims could be significant for the realization of the invention individually as well as in any combination.